The section from Papeete to Valparaiso (Plate III.) is about 5,000 miles in length, and is naturally divided into two parts, the run southwards to the parallel of 40° S., and the course along that parallel towards Valparaiso.

Setting aside Station 279 in 680 fathoms close to Tahiti, the mean depth throughout the section was 2,139 fathoms, considerably less than that of the meridional section from Honolulu to Tahiti, and very much less than that of the section in the North Pacific, between Japan and San Francisco. The nature of the bottom is very much the same as in the meridional section, red clay imbedding nodules, and lumps of various sizes of manganese peroxide, and passing in the shallower soundings into more or less pure Globigerina ooze, and as in the section between Hawaii and Tahiti the fauna is generally meagre. The trawling between Juan Fernandez and Valparaiso (Station 298) was particularly interesting; animal forms were much more abundant than they usually are in the Pacific; and the general character of the assemblage resembled in a remarkable degree that of the fauna of the Southern Sea in the neighbourhood of the Crozets and Kerguelen, many of the species, including some singular Urchin of the family Ananchytidæ, being identical. The bottom at this station was a bluish mud, the surface layer containing little or no carbonate of lime, and curiously enough a deeper layer, with a considerable proportion of Globigerina shells. There was no considerable quantity of manganese in the sounding. Notwithstanding the considerable depth of 2,225 fathoms, the conditions in this locality seem much more favourable to animal life than even the manganese area; and I am inclined to think that we had struck upon one of the highways by which migration takes place to the northward from the Southern Sea.

Although there are certain points which have yet to be worked out in detail, the general distribution of temperature in the Pacific seems sufficiently simple. In the first place, the whole mass of water consists of two well-marked divisions, an upper layer of no great depth, in which there is rapid cooling from the surface downwards, and considerable variation in temperature in different localities; and a mass of water of incomparably greater amount, which extends to the bottom, and which may be said to have nearly the same temperature throughout. These two divisions shade into one another, but the isothermobath of 5° C. may be taken as indicating generally the limit between them; below this line the isothermobaths are still affected by surface thermal conditions, but comparatively slightly. Above the line of 5° C. the course of the isothermobaths is to all appearance entirely regulated by causes affecting the surface-temperature, that is to say directly or indirectly by surface currents produced by permament, periodic, or variable winds. The equatorial current occupies the region of the trade-winds, approximately from lat. 20° N. to 20° S., and there is a strong but narrow counter current entirely comparable with the counter current in the Atlantic between the parallels of 5° and 8° N. The water of the equatorial current has no free egress to the westward, being intercepted by the peninsula of Malacca and the islands of the Malay archipelago; but neither is it completely arrested, as the equatorial current is in the Atlantic by the unbroken coast of America; consequently a return current less permanent and less defined than the return current in the Atlantic finds its way to the north-eastward along the coast of Japan. The course of the Japan current is much the same as that of the Gulf-stream, and is due, as in the Atlantic return current, to the high initial velocity of the intercepted water; its influence on the temperature of the ocean is, however, much sooner reduced and obliterated.

The hot water of the Pacific equatorial current, instead of being gathered together and focussed by the form of the land-barrier, as it is in that of the Atlantic, spreads out in the middle and West Pacific in a vast sheet of abnormally warm water, extending to a depth of nearly 100 fathoms; thus the isobathytherm of 25° C. at 80 fathoms passes near Hawaii and Tahiti, and near the parallel of 20° N. on sections between the Admiralty Islands and Japan. The lower isothermobaths of the upper layer are a little nearer the surface in lat. 40° N. than in lat. 40° S.; and this I believe to be due to the banking of the Antarctic indraught against the Arctic land-barrier, and to be the only case in which the position of the lines of equal temperature in the upper layer is not absolutely dependent upon the wind.

The temperature of the underlying cold water is derived from another source, and its distribution is governed by other laws. Throughout the Pacific the isothermobath of 5° C. maintains on the whole a very even course, oscillating between the 400 and 500-fathom lines. These oscillations depend upon causes acting on the surface, for the line rises and falls in harmony with the higher isothermobaths. The line of 5° C. deviates sensibly on two occasions from its comparatively straight course. In the equatorial region it sinks to a depth of 625 fathoms, probably from the communication of heat from the upper layer of water by mixing; and in lat. 40 it rises to 300 fathoms, probably, as I have already said, from the accumulation of cold water against the Arctic barrier. The next three degrees of temperature are lost with increasing slowness in the next 700 fathoms, the line of 2° C. making a very even course at a depth of 1,100 fathoms, and the remaining degree or degrees and a fraction is lost between 1,100 fathoms and the bottom. The depth of the Pacific increases slowly from the south to the north, the mean difference between the depth of the South Pacific and that of the north being perhaps as much as 1,000 fathoms. Notwithstanding this increase in depth, we have satisfied ourselves, although the determination is one of great difficulty, that the bottom temperature rises slightly from the south northwards. We can scarcely say more than that it rises slightly, for the differences in the temperatures below 1,500 fathoms are so small that a result can only be arrived at by a careful combination and comparison of many observations, taking into full consideration the errors of the thermometers arising from all sources. There is a like very slight decrease in the bottom-temperatures from east to west.

I think we can scarcely doubt that like the similar mass of cold bottom water in the Atlantic, the bottom water of the Pacific is an extremely slow indraught from the Southern Sea. That it is moving, and moving from a cold source, is evident from the fact that it is much colder than the mean winter temperature of the area which it occupies, and colder than the mean winter temperature of the crust of the earth; that it is moving in one mass from the southward is shown by the uniformity of its conditions, by the gradual rise of the bottom-temperatures to the northward, and by the fact that there is no adequate northern source of such a body of water, Behring's Strait being only forty fathoms deep, and a considerable part of that area being occupied by a warm current from the Pacific into the Arctic Sea, and by our knowledge from observations that one or two trifling currents from the Sea of Okotsk and the Behring Sea, which are readily detected and localised, and are quite independent of the main mass of cold water, represent the only Arctic influx. During its progress northwards the upper portion of the mass becomes slightly raised in temperature by mixture with, and possibly by slow conduction from, the upper layers which are affected by solar heat. At the end of the Gulf, that is to say in the extreme north, furthest from the cold source, the temperature is, as I have already pointed out, influenced to the very bottom; and the isothermobaths between 8° and 5° C. are obviously raised and pressed together, probably by the accumulation of the cold water against the land. The colder bottom-water to the westward might be expected from the lower initial velocity of the Antarctic water causing it to drag against the west coast.

I am every day more fully satisfied that this influx of cold water into the Pacific and Atlantic oceans from the southward is to be referred to the simplest and most obvious of all causes, the excess of evaporation over precipitation in the northern portion of the land hemisphere, and the excess of precipitation over evaporation in the middle and southern part of the water-hemisphere.

After what I have already said I need scarcely add that I have never seen, whether in the Atlantic, the Southern Sea, or the Pacific, the slightest ground for supposing that such a thing exists as a general vertical circulation of the water of the ocean depending upon differences of specific gravity.

NOTES

THE forty-seventh anniversary of the Zoological Society was held on Saturday last, Viscount Walden, F.R.S., the President, being in the chair. Mr. P. L. Sclater, F.R.S., the Secretary, read the report, which showed that the income (28,738*l.*) was greater than it had been in any previous year since the foundation of the Society. The total number of visitors in 1875 had been 699,918. The new lion house had been, as far as its main portions were concerned, completed and opened to the public. The building contains fourteen dens, the larger of which measure 20 ft. by 12 ft., the smaller being 12 ft. square. The out-door cages are to be completed by the end of July next; they will measure 44 ft. by 29 ft. Mr. Sclater desired it to be known that of the larger Felidæ, the Ounce (*Felis uncia*) was a desideratum. The adoption of the report was moved by Prof. Huxley, seconded by Prof. Tennant, and carried unanimously.

Our readers will regret the very sudden death of Lieut. J. E. Cornelissen, which occurred at Brussels in the month of March. Those who enjoyed the pleasure of his acquaintance will remember the hearty sailor-like demeanour of the man, while all who have paid attention to maritime meteorology will be ready to recognise his high scientific merits and the practical turn of mind which made the marine publications of the Utrecht Institute so eminently useful to seamen. He had been for sixteen years at the head of the marine branch of that establishment, having succeeded Andrau. He leaves a wife and four children utterly unprovided for.

The following are the names of the Commissioners appointed to inquire into various matters connected with the Scottish University:—Lord Justice-General Inglis, the Duke of Buccleuch, Lord Moncreiff, the Right Hon. Lyon Playfair, C.B., Sir William Stirling Maxwell, James Craufurd, one of the Senators of the College of Justice in Scotland, William Watson, her Majesty's Solicitor-General for Scotland, John Muir, D.C.L., James Anthony Froude, Archibald Campbell Swinton, LL.D., Prof. Huxley, Dr. James Alexander Campbell, LL.D.

We learn from the *Illustrated Australian News*, of Feb. 23, that a party consisting of Mr. Lawes, M. O. C. Stone, F.R.G.S., Mr. Hargreave, of Sidney, and Mr. K. Broadbent, bird collector, together with several Southsea Islanders, have made a successful excursion into the interior of New Guinea from Port Moresby. They attained a village called Munikaihila, situated 1,000 feet above the sea-level, and were well received by the natives. The view from this point was very fine. "All around were mountains and hills of every shape and size, covered with trees to the very summits," and Mount Owen Stanley rose as a grand background to the panorama apparently about twenty miles distant. We shall no doubt shortly receive a notice of Mr. Broadbent's discoveries.

We have much pleasure in noting that in the monthly publication of tri-daily meteorological observations issued from Vienna, Dr. Jelinek has this year included two stations the observations at which, in addition to their climatological importance, cannot fail to be of the greatest value in constructing weather-maps, viz., Sulina, near the mouth of the Danube, and Alexandria, in Egypt.

In a further discussion of the temperature observations made at the Museum of Natural History, at Paris, the MM. Becquerel point out that the mean temperature of the soil under grass is a little in excess of that under bare soil, and that under grass the temperature has not fallen below 32°, a fact of some importance in horticulture.

Prof. Nordenskjöld is to leave Gothenburg, on July 10, in a steamer of 163 tons for another cruise to the mouth of the Jenesei. He will sail up the river as far as Dudinko, when the steamer will take merchandise on board and return to Norway, the object of this expedition being to prove that there is a maritime route between Norway and the Siberian coast. We learn from *L'Explorateur*, moreover, that a Russian steamer is to leave the Jenesei and proceed to St. Petersburg by the Kara Sea, the North Sea, and the Baltic.

M. Marié Davy, the Director of the Montsouris Observatory, is to try whether Crookes's rotating radiometer can be utilised for actinometric purposes. No establishment is in a better position to try the experiment, Montsouris being supplied with regular actinometers, and special tables having been calculated for regulating as far as possible, their daily use.

It is announced that Sir Bartle Frere is to be made a baronet.

The Queen has conferred upon Lieut. Cameron—who was presented to her Majesty last Friday—the honour of Companion of the Bath, in recognition of his distinguished services in Africa.

At the Annual Meeting of the Royal Institution on Monday, a piece of plate and a purse containing 300 guineas, were presented to Prof. Tyndall as a testimonial of congratulation on his recent marriage.

During the siege of Paris experiments were tried to make use of the conductibility of the Seine in order to establish communications with the outer world in spite of the Prussian blockade. Paris, however, surrendered before the apparatus had been arranged on the Upper Seine. This scheme has not been totally abandoned, and M. Bourbouge a *preparateur* of the Sorbonne has tried to establish the telegraph without wire. According to M. Parville, the plan has succeeded at a small distance by expending a large quantity of electricity, not less than forty elements being required to work a magnetic needle at a distance of a quarter of a mile. The same experimenter is said to collect spontaneous currents from the earth with large electrodes. The interest of these experiments is unquestionable.

From the "Annual Report upon the Survey of Northern and North-western Lakes, in charge of C. B. Comstock, Brigadier-General, U.S.A.," we learn that the triangulation has been carried around the south end of Lake Michigan, and stations have been located for its extension south and east toward Lake Erie. On Lake Ontario the topography has been essentially completed from the head of the Saint Lawrence along the south shore to within twenty miles of the Niagara River, and the off-shore hydrography has made about the same progress. Triangulation-stations have been located as far west as Erie, Pa., and have been built as far as the Niagara River. Charts of Lake Saint Clair, and No. 2 of the Saint Lawrence River are completed. It is proposed during the present fiscal year to complete the field-work of the survey of Lake Ontario and commence that of Lake Erie. In the estimate of $184,000 for the survey of the lakes for the next fiscal year, an item of $25,000 has been included for the survey of the Mississippi River. No complete and accurate survey of the river has ever been made.

Part I., No. IV., for 1875, of the *Journal of the Asiatic Society of Bengal*, contains papers on the Angámi Nágás and their language, by Capt. J. Butler, on the Maiwár Bhils, by Mr. T. H. Hendley, and specimens of popular songs of the Hamirpur District, Bundelkund, by Mr. F. A. Smith.

The fifth part of the Bulletin of the Bussey Institution of Harvard University for 1876, completing vol. i., has just been published, and contains a number of valuable papers, principally by Prof. Storer, Dr. Farlow, and Mr. Sargent. Dr. Farlow's papers treat of the fungi found in the vicinity of Boston, of the olive and orange trees of California, of the American grape-vine mildew, and of the black knot. Mr. Sargent reports the addition of 165 species of trees and shrubs to the arboretum during the past year, and that over 100,000 plants have been raised. The papers of Prof. Storer, as usual, are of much scientific value.

On the 10th of January last, Mr. Lancelot Studdert, LL.D., read a paper before the Royal Irish Academy (since published in the *Proceedings* of that learned body) on "The free and albuminoid ammonia yielded by the stagnant waters of the Dublin streets, as compared with the quantities of those substances obtained from the Liffey water receiving the sewage." Twenty-nine street waters were examined; the mud, also, left from some was examined for ammonia. The following are Dr. Studdert's deductions:—The average of free ammonia from the four samples of the river was 0·0982, or under 1-10 of a grain in the gallon; the average of albuminoid ammonia from the same is 0·0779, or under 1-12 of a grain in the gallon. The average of free ammonia obtained from the twenty-nine street waters is seventeen grains to the gallon; that is, over 170 times the like average from the river. The average of albuminoid ammonia from the street water is three grains to the gallon, or thirty-eight times the Liffey average. The maximum of free ammonia from the river only reached 0·175, or less than 1-5 of a grain to the gallon; whilst the maximum of free ammonia from the street waters was 105 grains to the gallon, that is exactly 600 times greater than the river maximum. The least impure of the twenty-nine street waters yielded nearly three times more albuminoid ammonia than the most impure sample of the river water. The average of disintegrating animal refuse in the Liffey is 0·779, or just 3-4 of a grain in the gallon; whilst the average of such refuse in the street waters is twenty-nine grains to the gallon. That much of this animal matter must, if not rapidly removed, take forms that will vaporise, seems to the writer all but certain, since the conditions for spontaneous decomposition may be said to be always present; and he concludes that the continued presence of so much dirt in the streets would go far to account for the high death-rate (33 to the 1,000, yearly), then lately recorded for Dublin, and that better scavenging and a level surface for the streets are at once required.

THE proposal for establishing a mountain exploration club in America, with similar objects to the Alpine clubs of England and Switzerland, is meeting with a good deal of encouragement, and several meetings have been held for the purpose of organising it.

MR. BRYCE M. WRIGHT, of No. 90, Great Russell Street, Bloomsbury, has just received a most perfect specimen of Fossil Turtle (*Chelonia Hoffmanni*) from the Upper Chalk of Maestricht. It is 4 feet 1 inch in length and 22 inches wide, more than twice as large as the largest English specimens from Harwich and Swanage, Dorset, and is indeed the largest known.

THE correspondent J. C., who last year sent us a query concerning the cause of death of the house-fly, writes that recently he noticed that a humble-bee had five small animals like yellow spiders on its neck, and two more on its body. He had previously noticed a number of hive-bees lying dead on the greenhouse floor. Another correspondent explained that the death of the fly was caused by parasites, and J. C. wishes to know if those on the bee are the same, and if they cause the death of bees as well as flies.

THE Lord Mayor and the Lady Mayoress will entertain the President of the Royal Society, the Astronomer-Royal, the Presidents of the Royal Colleges of Physicians and Surgeons, and other distinguished representatives of science, at a grand banquet in the Mansion House, on Saturday-week, the 13th instant.

THE opening meeting of the Northamptonshire Natural History Society and Field Club was held at Northampton on April 21, Lord Lilford in the chair. This Society starts under good auspices, with a roll of sixty members, and we hope it will soon get into vigorous working trim.

IT is officially announced that the Philadelphia Exhibition will be opened on the 10th instant.

THE additions to the Zoological Society's Gardens during the past week include two Bennett's Cassowaries (*Casuarius bennetti*) from New Britain, presented by the Rev. George Brown; an Indian Gazelle (*Gazella bennettii*) from India, presented by Lieut. King, 76th Regiment; a Common Badger (*Melestaxus*) European, presented by Mr. W. Barneby; a Dusky Ichneumon (*Herpestes pulverulentus*) from India, a broad-fronted Crocodile (*Crocodilus frontatus*) from W. Africa, presented by Dr. Alex. Jennens; four Blackish Sternotheres (*Sternothærus subniger*) from Madagascar, presented by Mr. Lionel Hart; two Protei (*Proteus anguinus*) European, presented by Sir Bartle E. Frere; a White-fronted Capuchin (*Cebus albifrons*) from S. America, a White-throated Capuchin (*Cebus hypoleucus*) from Central America, a Lyre Bird (*Menura superba*) from Australia, a Hoffmann's Sloth (*Cholopus hoffmanni*) from Panama, three Common Boas (*Boa constrictor*) from S. America, deposited; a Collared Fruit Bat (*Cynonycteris collaris*) born in the Gardens.

SCIENTIFIC SERIALS

Journal of the Chemical Society, No. clix., March 1876.—This number contains a lengthy account of the researches of Dr. Wright and Mr. G. H. Beckett on narcotine, cotarnine, and hydrocotarnine, being the third of a series of papers read by them before the Chemical Society on their researches in this direction.—Mr. E. Neison gives an account of the sebates of the alcoholic series and an additional note on the sebate of cobalt.—A paper by Mr. P. P. Bedson, B.Sc., on some compounds of ether with anhydrous metallic chlorides, and one by Mr. R. W. Emerson MacIvor, on the iodides of antimony, complete the list of those papers read before the Chemical Society.—Numerous abstracts of papers published in other journals on various bodies in the different departments of chemistry occupy the greater part of the work now before us.

Gazzetta Chimica Italiana, Fascicolo IX. e X., Anno V., 1875, These parts contain the following papers:—Action of anhydrous chloral, and of the hydrate on aniline, by D. Amato. The author has obtained by this reaction a new base formed according to the equation:—

$$\underset{\text{Chloral}}{CCl_3COH} + \underset{\text{Aniline.}}{2C_6H_5NH_2} = H_2O + \underset{\text{New base.}}{CCl_3CH\left\{\begin{matrix}NHC_6H_5\\NHC_6H_5\end{matrix}\right.}.$$

The new substance forms square tabular crystals melting at 100°, soluble in alcohol, ether, and benzene, and insoluble in water. Distilled with excess of potash it yields phenylic cyanide:—

$$CCl_3CH\left\{\begin{matrix}NHC_6H_5\\NHC_6H_5\end{matrix}\right. + 3KHO = 3H_2O + 3KCl + 2C_6H_5CN.$$

The author describes also the hydrochloride $CCl_3(NHC_6H_5)_2HCl$, and the platino-chloride $[CCl_3CH(NHC_6H_5)_2HCl]_2PtCl_4$.—Study of essence of Cubibs, by A. Oglialoro. The author shows that this substance contains:—(1) a small quantity of a hydrocarbon $C_{10}H_{16}$, boiling at 158°—163°. 2. A hydrocarbon $C_{15}H_{24}$, boiling at 264°—265°, forming with hydrochloric acid the compound $C_{15}H_{24}$ 2HCl. 3. A hydrocarbon boiling at 262°—263° not forming a compound with HCl, the composition of which is at present doubtful. The action of these hydrocarbons on the polarised ray is also described.—On the natural poison of the extract of human bodies, by Prof. A. Moriggia and A. Battistini. The remainder of the part is occupied by extracts from foreign journals.

Poggendorff's Annalen der Physik und Chemie. Ergänzung. Band vii. Stück 3.—In a paper in this number on the magnetism of steel bars, by M. Fromme, it is shown that the temporary magnetism increases at first more slowly, then more quickly, and again more slowly than the magnetising force. M. Fromme also got the interesting result that when the remanent magnetism, through repeated action of a force *P*, has reached its limit, (the saturation corresponding to this force), a smaller force, *p*, is not capable of altering it. For every permanent moment of a steel bar there are, from zero onwards, a series of magnetising forces, in relation to which the bar has the properties of a bar of soft iron (without coercive force). Exact determinations were made of the function of magnetisation for forces having this effect; and it is shown that the Neumann-Kirchhoff developments on this subject cease to hold good as soon as the steel is permanently magnetic. M. Fromme further finds that the temporary magnetism of a steel bar, with repeated magnetisation by a constant current, decreases, but in such a way that the whole magnetism